ABSTRACT:

This paper presents an acoustic noise canceling technique using an inverse kepstrum system as an innovations-based whitening application for an adaptive finite impulse response (FIR) filter in beamforming structure. The inverse kepstrum method uses an innovations-whitened form from one acoustic path transfer function between a reference microphone sensor and a noise source so that the rear-end reference signal will then be a whitened sequence to a cascaded adaptive FIR filter in the beamforming structure. By using an inverse kepstrum filter as a whitening filter with the use of a delay filter, the cascaded adaptive FIR filter estimates only the numerator of the polynomial part from the ratio of overall combined transfer functions. The test results have shown that the adaptive FIR filter is more effective in beamforming structure than an adaptive noise canceling (ANC) structure in terms of signal distortion in the desired signal and noise reduction in noise with nonminimum phase components. In addition, the inverse kepstrum method shows almost the same convergence level in estimate of noise statistics with the use of a smaller amount of adaptive FIR filter weights than the kepstrum method, hence it could provide better computational simplicity in processing. Furthermore, the rear-end inverse kepstrum method in beamforming structure has shown less signal distortion in the desired signal than the front-end kepstrum method and the front-end inverse kepstrum method in beamforming structure.